

REMARKS/ARGUMENTS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 18-32 are pending in this application.

In the outstanding Official Action, Claims 18-22 were rejected under 35 U.S.C. §103(a) as unpatentable over Applicant's Prior Art in view of Tsai et al. (U.S. Patent No. 6,245,639 hereinafter "Tsai"); Claim 23 was rejected under 35 U.S.C. §103(a) as unpatentable over Applicant's Prior Art in view of Tsai and further in view of Moriyama (JP 06-268178); Claims 24-27 and 30-32 were rejected under 35 U.S.C. §103(a) as unpatentable over Applicant's Prior Art in view of Tsai and further in view of Lin (U.S. Patent No. 6,297,082); Claim 28 was rejected under 35 U.S.C. §103(a) as unpatentable over Applicant's Prior Art in view of Tsai and Lin and further in view of Moriyama; Claim 28 was rejected under 35 U.S.C. §103(a) as unpatentable over Applicant's Prior Art in view of Tsai and Lin and further in view of Shida (U.S. Patent No. 6,049,113).

With regard to the rejection of Claims 18 and 19 under 35 U.S.C. §103(a) as unpatentable over Applicant's Prior Art in view of Tsai, that rejection is respectfully traversed.

Claim 18 recites, "the shallow trench isolation film and the gate oxide film are doped with boron."

The outstanding Office Action alleges at page 3, lines 5-6 that Tsai describes "Where the shallow trench isolation and the gate oxide are doped with boron." However, Tsai does not disclose that the gate oxide is doped with boron. It is respectfully noted that Tsai states at column 3, lines 26-28 that "The interstitial silicon will allow movement of boron to occur from the channel region, underlying gate insulator 2, and gate structure 3, to edge 7, during the subsequent thermal cycles." (emphasis added). Since gate insulator 2 does not underlie

the channel region, the above-noted underlined description should not be read that boron moves from the channel region as well as from gate insulator 2, but should be read that boron moves from the channel region (which is) underlying the gate insulator 2 to edge 7.

Further, it is respectfully noted that Tsai describes at column 3, lines 38-41 no more than “the interstitial silicon, at edge 8, will enhance the movement of, or allow boron to be depleted from the channel region to edge 8.” This also does not teach or suggest that boron is doped into gate insulator 2.

Still further, column 4, lines 27-31, 37-40 and 42-43 of Tsai state that “First, silicon oxide layer 16 ... is used to completely fill shallow trench shape 13.” Then, “A threshold adjust ion implantation procedure ... such as boron or BF_2 ... is next performed,” and (after this procedure) that “A silicon dioxide gate insulator layer 2, is thermally grown.” As gate insulator layer 2 is formed *after* the boron implantation into the channel region, the gate insulation later 2 described by Tsai would not have boron doped therein.

Accordingly, Tsai does not describe that boron is even located in gate insulator 2, much less that boron is doped into gate insulator 2.

Further, the motivation recited in the outstanding Office Action, “it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Applicant’s Prior Art to incorporate boron in the shallow trench isolation to enhance the movement of boron which is depleted from the channel region which results in better narrow channel effect as taught by Tsai,”¹ is contradicted by the teachings of Tsai.

Tsai describes that the reverse narrow channel effect is a negative effect that is the result of boron moving from the channel region to the source/drain-channel interface or a source/drain-isolation interface, depleting the channel region.² Tsai describes implanting nitrogen into the edges of the source/drain at the source/drain-isolation interface to block the

¹See outstanding Office Action, page 3, lines 9-13.

²See Tsai, column 1, lines 19-39.

movement of boron to this interface.³ Thus, Tsai describes that the movement of boron is a negative effect to be minimized by the implantation of nitrogen. Consequently, as Tsai teaches against the motivation cited in the outstanding Office Action, it is respectfully submitted that there is no motivation to make the proposed combination.

Thus, it is respectfully submitted that Tsai does not disclose and does not give any motivation that boron is doped in the gate insulator 2. Accordingly, Claim 18 is believed to be patentable over Applicant's Prior Art in view of Tsai.

As Tsai does not disclose *any* impurities doped in a shallow trench isolation film, Claim 19 (and Claims 20-22 dependent therefrom) are also believed to be patentable over Applicant's Prior Art in view of Tsai.

Moreover, it is respectfully submitted that Moriyama also does not disclose that impurities (or boron) are doped in a shallow trench isolation film. Accordingly, Claim 23 is believed to be patentable over Applicant's Prior Art in view of Tsai and further in view of Moriyama.

Finally, it is respectfully submitted that neither Lin nor Shida discloses that impurities are doped in a shallow trench isolation film. As Claim 24 recites "the shallow trench isolation films ... are doped with the same impurities as those doped in the channel region," Claims 24-32 are believed to be patentable over the cited references for at least the reasons described above with respect to Claim 18.

³See Tsai, column 4, lines 17-23.

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Accordingly, the outstanding rejections are traversed and the pending claims are believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

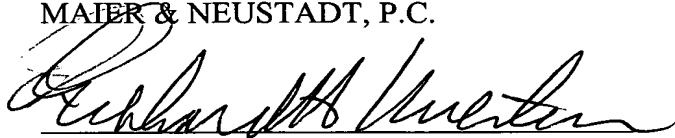
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Respectfully submitted,

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A handwritten signature in black ink, appearing to read "Eckhard H. Kuesters", written over a horizontal line.

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